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Comparison between Pre-Operative Findings and Per-Operative Findings of Stomach Cancer

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Abstract **Original Research Article**

***Background*:** Accurate pre-operative assessment of stomach cancer is critical for effective treatment planning and improved surgical outcomes. However, discrepancies between pre-operative and per-operative findings can impact surgical decision-making and patient prognosis. This study aimed to compare pre-operative and per-operative findings in stomach cancer patients, with a focus on tumor location, size, staging, lymph node involvement, and metastasis. ***Methods*:** This prospective study was conducted at Department of Surgery, Sylhet MAG Osmani Medical College Hospital, Sylhet, from September 2022 to August 2023, involving 100 patients diagnosed with stomach cancer. Patients underwent pre-operative evaluations using endoscopy, CT scans, and biopsy, followed by surgical intervention. Pre-operative findings were compared with per-operative observations, with a particular focus on tumor location, size, stage, lymph node involvement, and metastasis. Statistical analyses were performed using SPSS version 26 to assess the significance of the differences observed. ***Results*:** The study found that the most common tumor locations were the antrum (32%) and body (24%). Tumor size was predominantly 2-4 cm (52%), with a notable consistency between pre-operative and per-operative measurements. Pre-operative staging revealed that 35% of patients were at stage II, which increased to 38% per-operatively. Lymph node involvement was observed in 60% of patients pre-operatively, increasing to 65% during surgery. Metastasis was present in 20% of patients pre-operatively, slightly increasing to 22% per-operatively. ***Conclusion*:** The findings highlight the limitations of current pre-operative diagnostic techniques in accurately staging stomach cancer, particularly concerning lymph node involvement and tumor size. Integrating advanced imaging techniques and biomarkers into standard pre-operative evaluations could improve the accuracy of assessments and enhance surgical outcomes.

Keywords: Stomach cancer, Pre-operative findings, Per-operative findings, Tumor staging, Lymph node involvement.

INTRODUCTION

Stomach cancer is the third leading cause of cancer-related deaths globally, following lung and colorectal cancer, and ranks as the seventh most common type of cancer worldwide. The Global Burden of Diseases, Injury, and Risk Factors Study (GBD) estimated that in 2017, there were approximately 1.22 million new cases of stomach cancer and 865,000 deaths attributed to the disease [1]. Despite significant advancements in surgical treatments over recent decades, the mortality rate for stomach cancer remains high [2]. According to statistical data, the 5-year survival rate for patients undergoing curative treatments, such as gastric resection and lymphadenectomy, is less than 30% for those with stage IIB or more advanced cancer, while it is around 70% for patients with stage I resected gastric cancer [3]. Accurate preoperative evaluations are crucial for improving surgical outcomes and planning effective treatments. Imaging modalities, such as computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound, are commonly used for the preoperative staging of stomach cancer. CT scans, particularly three-dimensional multidetector CT gastrography, have proven effective in detecting and localizing stomach tumors, providing detailed information about the extent of the disease and lymph node involvement [4]. However, these imaging techniques have certain limitations. For instance, while CT scans are generally effective in identifying advanced cancer stages, they are less reliable in detecting early-stage cancer and lymph node metastases [5]. Endoscopic evaluations play a vital

role in both the diagnosis and staging of gastric cancer. Endoscopic ultrasound (EUS) is particularly valuable for surgical planning, as it helps assess the depth of tumor invasion and lymph node involvement. Research has shown that EUS offers higher accuracy compared to CT scans in evaluating tumor invasion and identifying small lymph node metastases [6]. This precision is essential for predicting the likelihood of achieving complete tumor removal and tailoring surgical strategies accordingly. Histopathological evaluations, such as biopsies, are indispensable for confirming diagnoses and characterizing tumors. These evaluations can aid in cancer staging and predicting surgical outcomes. The correlation between preoperative biopsy findings and postoperative histopathological results underscores the importance of accurate preoperative biopsies in surgical planning [7]. Additionally, studies have investigated the prognostic significance of tumor markers. Elevated levels of these markers may suggest their potential utility in preoperative assessments [8]. Despite advancements in diagnostic tools, discrepancies between preoperative findings and per-operative observations are common. Such variances can significantly impact surgical decision-making and patient outcomes. In a study conducted in Bangladesh, significant differences were observed in the assessment of lymph node involvement and lesion characteristics between preoperative evaluations and per-operative findings. The study revealed that although CT scans were more accurate than ultrasonography, considerable gaps remained in preoperative planning [9]. Another study evaluating the accuracy of dynamic CT in the preoperative staging of gastric cancer found that while CT was generally effective in detecting advanced cancer stages, it had limitations in early cancer detection and lymph node metastases, which affected surgical planning [5]. These findings highlight the need for a multimodal diagnostic approach to enhance preoperative assessments. Combining advanced imaging techniques with thorough histopathological analyses can provide a more comprehensive understanding of the disease, leading to improved surgical planning and outcomes [10]. Furthermore, preoperative lymphocyte counts and tumor markers have shown potential in predicting postoperative outcomes, underscoring the importance of a multidisciplinary approach to preoperative evaluations [8, 11]. Psychological factors also play a significant role in patient outcomes. A study on Chinese patients recently diagnosed with gastrointestinal cancer found that severe psychological distress was associated with symptoms such as anxiety, dietary restrictions, and stomach pain [12]. The study further indicated that patients with high levels of distress had lower overall survival and disease-free survival rates, emphasizing the importance of addressing psychological distress in patient care [13]. These findings highlight the necessity of comprehensive patient care that considers both psychological and physical factors. This study aims to compare pre-operative and per-operative findings in stomach cancer, focusing on the discrepancies and correlations between the two, particularly within the context of Bangladesh.

METHODS

This prospective study was conducted at the Department of Surgery, Sylhet MAG Osmani Medical College Hospital, Sylhet, from September 2022 to August 2023. The study was designed to compare pre-operative findings with per-operative findings in patients diagnosed with stomach cancer. The inclusion criteria for the study were patients aged 18 years and older with a confirmed pre-operative diagnosis of stomach cancer based on imaging techniques such as endoscopy, CT scans, and biopsy. Additionally, patients scheduled for surgical intervention for stomach cancer who provided informed consent and had complete medical records, including detailed pre-operative and per-operative findings, were included in the study. Patients with concurrent malignancies or severe comorbidities that could interfere with the study outcomes, as well as those who received neoadjuvant chemotherapy or radiotherapy prior to surgery, which could alter the tumor characteristics between pre-operative and per-operative assessments, were excluded. A cohort of patients who were pre-operatively diagnosed with stomach cancer through various imaging techniques, such as endoscopy, CT scans, and biopsy, was selected. Pre-operative findings, including tumor location, size, and staging, were meticulously documented. During surgery, the per-operative findings, including the actual tumor characteristics and extent, were recorded in detail. Discrepancies between pre-operative and per-operative findings were noted and analyzed to assess the accuracy and reliability of pre-operative diagnostic methods. Statistical analyses were performed to determine the significance of the differences observed. Statistical analysis was performed using SPSS version 26.

RESULTS

Table 1: Basic Characteristics of the Study (N: 100)

Characteristic	Frequency	Percentage (%)
Age Range (years)		
- 18-30	10	10
- 31-50	30	30
- 51-70	40	40
- 71-85	20	20
Gender Distribution		
- Male	60	60
- Female	40	40
Pre-Operative Diagnostic Methods		
- Endoscopy	100	100
- CT Scans	100	100
- Biopsy	100	100
Surgical Procedures		
- Total Gastrectomy	40	40
- Partial Gastrectomy	60	60

The study included 100 patients diagnosed with stomach cancer. The age distribution of the patients revealed that the majority were between 51-70 years old (40%), followed by 31-50 years (30%), 71-85 years (20%), and 18-30 years (10%). Gender distribution showed that 60% of the patients were male, and 40% were female. All patients underwent pre-operative diagnostic evaluations using endoscopy, CT scans, and biopsy, with each method applied to 100% of the participants. In terms of surgical interventions, 40% of the patients underwent total gastrectomy, while the remaining 60% underwent partial gastrectomy.

Table 2: Pre-Operative Findings (N: 100)

Variables	Frequency	Percentage (%)
Tumor Location		
Antrum	30	30
Body	25	25
Fundus	15	15
Pylorus	20	20
Lesser Curvature	5	5
Greater Curvature	5	5
Tumor size (cm)		
<2	10	10
2-4	50	50
>4	40	40
Pre-Operative Stage		
I	15	15
II	35	35
III	30	30
IV	20	20
Lymph Node Involvement		
Yes	60	60
No	40	40
Metastasis		
Yes	20	20
No	80	80

Table 3: Per-Operative Findings (N: 100)

Variable	Frequency	Percentage (%)
Tumor Location		
Antrum	32	32
Body	24	24
Fundus	14	14
Pylorus	21	21
Lesser Curvature	5	5
Greater Curvature	4	4
Tumor Size (cm)		
<2	8	8
2-4	52	52
>4	40	40
Per-Operative Stage		
I	12	12
II	38	38
III	32	32
IV	18	18
Lymph Node Involvement		
Yes	65	65
No	35	35
Metastasis		
Yes	22	22
No	78	78

In the pre-operative evaluation of the 100 patients, tumor location varied with the most common site being the antrum (30%), followed by the body (25%), pylorus (20%), fundus (15%), and both the lesser and greater curvatures (5% each). Tumor size was predominantly between 2-4 cm in diameter (50%), with 40% of tumors measuring larger than 4 cm and 10% smaller than 2 cm. In terms of staging, the majority of patients were diagnosed at stage II (35%), followed by stage III (30%), stage IV (20%), and stage I (15%). Lymph node involvement was observed in 60% of the patients, while 40% had no lymph node involvement. Metastasis was detected in 20% of the cases, whereas the remaining 80% showed no signs of metastasis.

Table 4: Comparison Between Pre-Operative and Per-Operative Findings (N: 100)

Parameter	Pre-Operative Findings	Per-Operative Findings	Difference (%)
Tumor Location			
- Antrum	30%	32%	+2%
- Body	25%	24%	-1%
- Fundus	15%	14%	-1%
- Pylorus	20%	21%	+1%
- Lesser Curvature	5%	5%	0%
- Greater Curvature	5%	4%	-1%

During the per-operative assessment of the 100 patients, the tumor location distribution was slightly adjusted, with the antrum still being the most common site at 32%, followed by the pylorus at 21%, body at 24%, fundus at 14%, and lesser and greater curvatures at 5% and 4%, respectively. Tumor size remained predominantly in the 2-4 cm range (52%), with 40% of tumors measuring larger than 4 cm, and a smaller proportion (8%) under 2 cm. The staging during surgery revealed that 38% of patients were at stage II, 32% at stage III, 18% at stage IV, and 12% at stage I. Lymph node involvement was found in 65% of patients, while 35% had no lymph node involvement. Metastasis was present in 22% of the cases, with 78% showing no evidence of metastasis.

DISCUSSION

This study aimed to compare pre-operative and per-operative findings in patients diagnosed with stomach cancer, focusing on tumor location, size, staging, lymph node involvement, and metastasis. The results revealed key discrepancies between the pre-operative assessments and the intraoperative findings, highlighting the complexities of accurate pre-operative staging and the implications for surgical planning and patient outcomes. The age and gender distribution of the patients in this study, with the majority being between 51-70 years and 60% being male, align with global trends in gastric cancer demographics. Similar demographic characteristics have been reported in various studies, reinforcing the relevance of our findings in a broader context [1]. The universal application of pre-operative diagnostic methods such as endoscopy, CT scans, and biopsy among our patients reflects standard clinical practice. However, despite these comprehensive evaluations, our findings show that discrepancies between pre-operative and per-operative tumor characteristics persist. For instance, the slight increase in tumor detection in the antrum from 30% pre-operatively to 32% per-operatively highlights the potential limitations of pre-operative imaging modalities in accurately localizing tumors [14]. The observed consistency in tumor size between pre-operative and per-operative assessments, with most tumors falling within the 2-4 cm range and a significant proportion exceeding 4 cm, underscores the reliability of imaging techniques in estimating tumor dimensions. This finding is supported by previous studies that have demonstrated the prognostic significance of tumor size, particularly in predicting survival outcomes [15, 16]. Moreover, the increase in patients staged at stage II from 35% pre-operatively to 38% per-operatively suggests that intraoperative evaluations may provide a more accurate assessment of tumor extent, particularly in distinguishing between stage I and stage II cancers. This is consistent with studies that emphasize the challenges in pre-operative staging, particularly in early-stage gastric cancer [17]. Lymph node involvement was found in 60% of patients pre-operatively, increasing to 65% during surgery. This finding is consistent with other studies that have reported similar increases in lymph node detection during surgery, reflecting the limitations of pre-operative assessments in accurately identifying nodal metastasis [18, 19]. The presence of metastasis in 20% of patients pre-operatively, with a slight increase to 22% per-operatively, further underscores the challenges in accurately staging advanced gastric cancer. The reliability of pre-operative markers, such as fibrinogen levels and neutrophil-to-lymphocyte ratios, in predicting lymph node metastasis has been highlighted in previous research, suggesting that these markers could potentially enhance pre-operative evaluations and guide surgical decision-making [20, 21]. Comparing our findings with other studies, it is evident that while current diagnostic modalities are effective in providing a preliminary assessment, they often fall short in accurately staging the disease, particularly in the presence of lymph node metastasis and early-stage cancers. Studies have shown that combining different imaging techniques, such as CT and PET/CT, may improve the accuracy of pre-operative staging, but challenges remain, particularly in predicting lymph node involvement and metastasis [4, 22]. The slight discrepancies observed in our study between pre-

operative and per-operative findings highlight the need for a multimodal approach, integrating advanced imaging techniques with reliable biomarkers, to improve the accuracy of pre-operative staging and ultimately enhance surgical outcomes. In conclusion, this study underscores the importance of accurate pre-operative evaluations in the management of stomach cancer. While significant progress has been made in diagnostic imaging and staging techniques, the discrepancies between pre-operative and per-operative findings highlight the need for continued improvement in these areas. Future research should focus on refining pre-operative diagnostic tools and exploring the integration of novel biomarkers to enhance the accuracy of gastric cancer staging and improve patient outcomes.

Limitations of the Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

This study highlights the importance of accurate pre-operative evaluations in the management of stomach cancer, demonstrating that while current diagnostic methods such as endoscopy, CT scans, and biopsy are effective in preliminary assessments, discrepancies still exist between pre-operative and per-operative findings, particularly in tumor staging, size, and lymph node involvement. These discrepancies underscore the need for enhanced diagnostic techniques and a multimodal approach to improve the accuracy of pre-operative staging and ultimately, surgical outcomes. The findings suggest that integrating advanced imaging modalities and reliable biomarkers into standard pre-operative evaluations could significantly reduce these discrepancies and lead to better-tailored surgical interventions, thereby improving patient outcomes.

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